ejpmr, 2016,3(12), 114-120

SJIF Impact Factor 3.628

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

DETERMINANTS OF MATERNAL MORTALITY IN CENTRAL ZONE OF TIGRAY REGION: A COMMUNITY BASED CASE-CONTROL STUDY.

Haftom Gebrehiwot[1]*, Hagos Kahsay[2] and Hagos Gebregziabher[3]

[1]Assistant professor in Maternal & RH, Department of Midwifery, College of Health Sciences, Mekelle University, Ethiopia.

[2]MD, Assistant professor in Internal Medicine, Department of Internal Medicine, School of Medicine, Mekelle University, Ethiopia.

[3]Lecturer in Anesthesiology, Department of Anesthesiology, College of Health Sciences, Mekelle University, Ethiopia.

***Corresponding Author: Haftom Gebrehiwot**

Assistant professor in Maternal & RH, Department of Midwifery, College of Health Sciences, Mekelle University, Ethiopia.

Article Received on 13/10/2016 **Article Revised on 02/11/2016** **Article Accepted on 23/11/2016**

ABSTRACT

Background: Maternal mortality represents a devastating medical complication in many societies. It has been realized that complications of childbirth and pregnancy is a leading cause of death among women of reproductive age. **Methods:** A Community based 1:4 (case to control) study design were conducted among all maternal deaths and controls occurred between January 1st, 2012 and December 30th, 2014. Respondents were selected by simple random sampling technique and data was entered, analyzed via Epi-info and Multiple logistic regressions were used to identify the confounding factors. **Results:** The study revealed that the mean age of the cases and controls were 31.9 years with SD of ±6, and 32 years SD±6.5 respectively. The three years pattern of maternal mortality showed 37.5% in the first year, 30% in the second year and slightly increment to 32.5% in the third year. Women with diabetics mellitus was 24 times higher risk of maternal death than women's who were not have Diabetics mellitus [AOR=24,95%Cl(5.21-110.91)].Similarly, Pre tem delivery was 14.4 times higher risk of maternal death than term deliveries [AOR=14,4%Cl(2.6-79.7)]. **Conclusion and Recommendation:** Post partum hemorrhage, Pre-Eclampsia, Eclampsia and Anemia were the major causes of maternal death. Gestational age and Diabetics mellitus were significantly associated with the maternal deaths. Therefore, this highlights the need of community mobilization to increase the awareness of mothers about the advantages of maternal health service utilization and need for inter-sectoral holistic intervention approach.

KEYWORDS: Maternal Mortality, MDGs, Case Control, Determinants, Tigray.

INTRODUCTION

Maternal mortality represents a devastating medical complication in many societies. It has been realized that complications of childbirth and pregnancy is a leading cause of death among women of reproductive age. This is clearly illustrated by the fact that improved maternal health and safety is named as a target for the fifth millennium development goal (MDG) set for accomplishment by the year 2015.[1]

Maternal mortality is the largest and the most persistent gap between developed and developing countries. Developing countries account for 99% of the global maternal deaths, with sub-Saharan Africa alone accounting for 56%. [2] The starkest inequitable tragedy of the event with the largest disparity showing nearly two-third (60%) of these deaths occurred in ten countries including Ethiopia.[3] Globally, maternal mortality has fallen by 47% between 1990 and 2010. This means that the overall aim of MDG 5 (a 75% reduction) is very unlikely to be achieved by 2015, unless there are remarkable further reductions from 2014 to 2015. Yet, apart from Southern Africa, substantial reductions in maternal deaths have been achieved in all regions of the world and this has been described as "one of the shameful failures of world's development".[4,5,6] Poor maternal health not only affects women's survival but has serious implications for the survival of their children as well.[7] Consequently, more than a decade, the world has been dedicated to the objective of the fifth Millennium Development Goal (MDG-5).[8,9]

The current evidence on the core maternal health indicators still classifies Ethiopia among the poorest in the world. Despite the marked improvements in the utilization of maternal health services, no apparent change in the reduction of MMR has been observed over the past 10 years. [10-12]Thus, it is critically important to identify the factors contributing to the existing high MMR nevertheless, such evidence are scarce in Ethiopia.

In addition, maternal mortality is one of the most sensitive indicators of the health disparity between richer and poorer nations. The lifetime risk of dying due to maternal causes is about one in six in the poorest countries, compared with about one in 30,000 in Northern Europe. Every minute, a woman dies from complications of pregnancy and childbirth in Africa 1 out 16 women stand the risk of dying through pregnancy and childbirth.[13, 14]

According to the EDHS 2011, Ethiopia has stagnated maternal mortality, which is 676 per 100,000 live births after declining from 871 per 100,000 live births in 2000 to 673 in 2005.[12] Efforts to reduce maternal mortality should focus on reducing the likelihood that a woman will have a high-risk pregnancy and pregnant woman will experience a serious complication of pregnancy or childbirth and improving the outcomes for women with complications[13]

In Ethiopia, about 25,000 women die every year due to pregnancy and childbirth complications, and several studies indicate that the major causes of maternal deaths are essentially the same around the world.[14] The five major pregnancy-related complications leading to maternal mortality are postpartum hemorrhage, puerperal infections, hypertensive disorders of pregnancy, obstructed labor and unsafe abortion.[15]

Therefore, this study is needed because maternal health improvement is one of the cores of Millennium Development Goals and research on maternal mortality may help to inform policy makers after the determinant factors of maternal mortality will be identified. This study is also assumed to provide baseline data for policy makers and education planners in developing appropriate evidence-based strategies to reduce maternal death.

Furthermore, it will be initial data or preliminary study for further studies related to this topic.

METHODS AND MATERIALS

Study area/ Study population/Design

This study were conducted in central zone of Tigray regional state in which the Zone is administratively divided in to 12 Woredas including two special urban woredas; Adwa and Axum town woredas. According to the projected census of 2007, the zone has a total population of 1,245,824 (613,797 male and 632,027 female.[16]

Women of reproductive age group (15 – 49 years) who were experienced pregnancy during the target year and residing in the selected three Woredas of the zone with required sample size of 380 (76 cases and 304 controls). All deaths of reproductive age group (15 - 49) women in the selected districts were included in the study.

Selection of Cases: Cases were all maternal deaths that are identified using ***Verbal Autopsy (VA).*** Basically, the identification of all maternal deaths that have occurred in the study area were include the following steps; first, a Census of all households were conducted in the study area (three districts) to identify all deaths of reproductive age group (15 – 49 years), irrespective of its cause. Secondly, the causes of death were identified using the 2012 WHO ***VA*** instrument. Finally, all confirmed maternal deaths were included in the study as cases.

Selection of Controls: The controls were selected from the list of all living women of reproductive age group (15 - 49) who gave birth in the specified period. The selection of Controls were include the following steps; first, in line with the census of all deaths, a Census of all households were conducted in the study area to identify all living women of reproductive age group (15 - 49) who gave birth in the specified period. Secondly, the Controls were grouped according to their age (in years) and their residence (Tabia). Finally, four controls were selected after matching by age and residence category of each Case.

The assumption used for sample size calculation were 95% CI. 80% power, 2.3 odds ratio and case to control ratio of 1:4 and the prevalence of exposure among controls are 20% based on similar study done in Tigray regional state, Ethiopia.[14]

A community based case control study design were conducted between October/2014 and June/2015.

Study Variables: Maternal death as dependent and Socio-demographic factor, Causes of maternal death as Independent Variables were used in this study.

Data Analysis and quality control

Data that are collected on paper forms were coded, entered and analyzed via EPI-Info Version 3.5.1. Appropriate training were given to all data collectors and supervisors prior to pretesting. Following appropriate training, a pre-test was conducted in 5% of the total sample size before finalizing the research proposal outside the study area. During the data collection periods, the supervisors were provide regular supervision to the data collectors and giving feedback on their daily bases. Independent variables that associate with the outcome variables were included in the model for multivariate analysis using logistic regration. Finally graphical presentations such as tables, line graphs, pie charts and texts were used to present the result finding of the study.

Ethical consideration

Ethical clearance were obtained from Mekelle University, IRB office. Respondents were assured their consent and confidentiality.

RESULTS

Socio - Demographic characteristics of respondents

A total of 40 cases and 160 controls were included in this study. The mean age among the cases was 31.9 years with SD of ±6, and among the controls 32 years SD ± 6.5).

All of the study subjects 40(100%) of the cases and 160(100%) of the controls were Tegaru in ethnicity. Regarding the residence of the study subjects 35(87.5%) cases, 133(83.1%) controls were living in rural area. and Marital status, about 36(90%) of the cases and 144(90%) of the controls were married.

Majority of the respondents, 40 (100%) of the cases and 157 (98.1%) of the controls were followers of Orthodox Christianity followed by Muslim who accounts for 2 (1.2%) of the controls respectively. More than sixty two percent of the cases and sixty six percent of the controls were illiterate.**(Table 1).**

Table 1: Socio-demographic characteristics of the respondents (N=200)

Variables	Cases (N=40)	Controls(N=160)	Total (N=200)
Age (in years)			
≤ 20 + ≥ 35	22(55%)	67(41.9%)	89(44.5%)
21 - 34	18(45%)	93(58.1%)	111(55.5%)
Residence			
Rural	35(87.5%)	133(83.1%)	168(84%)
Urban	5(12.5%)	27(16.9%)	32(16%)
Marital status			
Married	36(90%)	144(90%)	180(90%)
Divorced/separated/widowed	2(5%)	16(10%)	18(9%)
Single	2(5%)	0%	2(1%)
Religion			
Orthodox Christian	40(100)	157(98.1)	197(98.5)
Muslim	0	2(1.2)	2(1)
Catholic	0	1(0.6)	1(0.5)
Woman Educational status			
Ilitrate	25(62.5%)	66(41.2%)	91(45.5%)
Litrate	15(37.5%)	94(58.8%)	109(54.5%)
Husband educational status			
Illiterate	20(50%)	57(35.6%)	77(38.5%)
Literate	20(50%)	103(64.4%)	123(61.2%)
Monthly income(in birr)			
<500	40(100%)	143(89.4%)	183(91.5%)
>500	0	17(10.6%)	17(8.5%)
Distance			
Below 5 Km	13(32.5)	78(48.8)	91(45.5)
Greater than 5 Km	27(67.5)	82(51.2)	109(54.5)

Reproductive health information of the respondents

The study revealed that 27(67.5%) of the cases and 107(66.7%) controls were under married, ≤19 years old and 20(50%) of cases and 67(41.9%) of controls were grand multiparty.

Regarding place of delivery, 14(35%) cases and 136(85%) were delivered at home and 12(30%) of the cases and 18(11.2%) of the controls were extended their duration of labor greater than 12 hrs duration.

The proportion of women who received at least one ANC service was higher among controls 158 (98.8%) than among those who died (cases) 37(92.5%) **(Table2**).

Table 2: Reproductive health history of the respondents.

Characteristics	Cases (%) N=40	Controls (%) N=160	Total (%) N=200
1st marriage of the woman			
≤19 years	27(67.5)	107(66.7%)	134(67%)
≥ 20 years	13(32.5)	53(33.1%)	66(33%)
Total number of pregnancy(Gravidity)			
Primi	1(2.5)	12(7.5)	13(6.5)
2-4	19(47.5)	81(50.6)	100(50)
≥5	20(50)	67(41.9)	87(43.5)
Gestational age (in weeks)			

Pre term	8(20)	5(3.1)	13(6.5)
Term	30(75)	153(95.6)	183(791.5)
Post term	2(5)	2(1.2)	4(2)
Place of delivery			
Health facility	14(35)	136(85)	150(75)
Home	26(65)	24(15)	50(25)
Visit at least one for ANC			
Yes	37(92.5)	158(98.8)	195(97.5)
No	3(7.5)	2(1.2)	5(2.5)
Birth attendant			
Skilled birth attendant	14(35)	136(85)	150(75)
Non skilled birth attendant	26(65)	24(15)	50(25)
Duration of labor			
Less than 12 hrs	28(70)	142(88.8)	170(85)
Greater than 12 hrs	12(30)	18(11.2)	30(15)
HIV test			
Yes	29(72.5)	151(94.4)	180(90)
No	11(27.5)	9(5.6)	20(10)
HIV test result			
Negative	26(89.7)	148(98)	174(96.7)
Positive	0	1(0.7)	1(0.6)
Unknown status	3(10.3)	2(1.3)	5(2.8)

Obstetric complications during pregnancy

The most common complication during pregnancy among cases and controls was Diabetics mellitus 20% and 3.1%, hemorrhage (10%) and (5.6%) followed by pregnancy induced hypertension (10%) for cases and 1.9% for controls. In addition about 7.5% of the cases and 1.2% of the controls had complicated due to sepsis **(Table3).**

Table 3: Obstetric complications that occurred during pregnancy among the study subjects.

Characteristics	Cases (13)	Controls(187)	Total
Hemorrhage(APH)			
Yes	4(10%)	9(5.6%)	13(6.5%)
No	36(90%)	151(94.4%)	187(93.5%)
Pregnancy Induced Hypertension			
Yes	4(10)	3(1.9%)	7(3.5%)
No	36(90)	157(98.1%)	193(96.5%)
Sepsis			
Yes	3(7.5%)	2(1.2%)	5(2.5%)
No	37(92.5%)	158(98.8%)	195(97.5%)
Diabetics Mellitus			
Yes	8(20%)	5(3.1%)	13(6.5%)
No	32(80%)	155(96.9%)	187(93.5%)
Anemia			
Yes	2(5%)	8(5%)	10(5%)
No	38(95%)	152(95%)	190(95%)

Trends of maternal death in the community of Central zone, Tigray Region

During the three years retrospective study between1st January 2012 to 30th December 2014 in Central zone rural communities of Tigray regional state, 40 women who died due to complications of pregnancy and child birth within 42 days of delivery(cases) and 160 women who gave birth and survive (controls) were selected to see their patterns. In the 1st, 2nd and third years of the study, the case distribution was 37.5%, 30% and 32.5% respectively. **(figure1**).

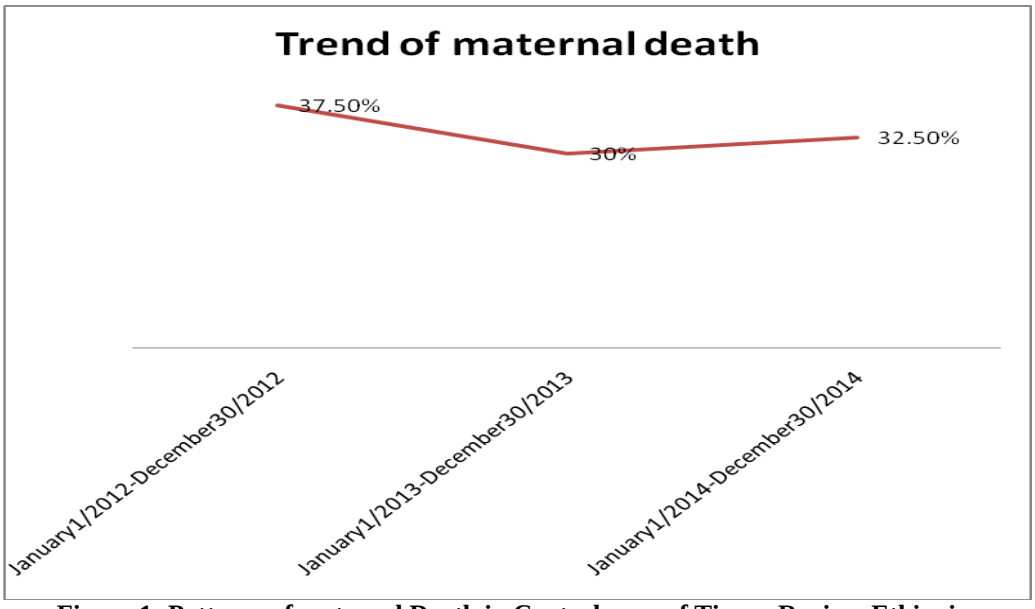

Figure 1: Patterns of maternal Death in Central zone of Tigray Region, Ethiopia.

Causes of maternal death among the study subjects

Major causes of maternal deaths were Obstetrics hemorrhage after delivery (PPH) and PIH (pre-Eclampsia, Eclampsia) which accounts 50% and 20% respectively followed by Anemia (15%), sepsis (10%) and Abortion (2%) **(Figure 2).**

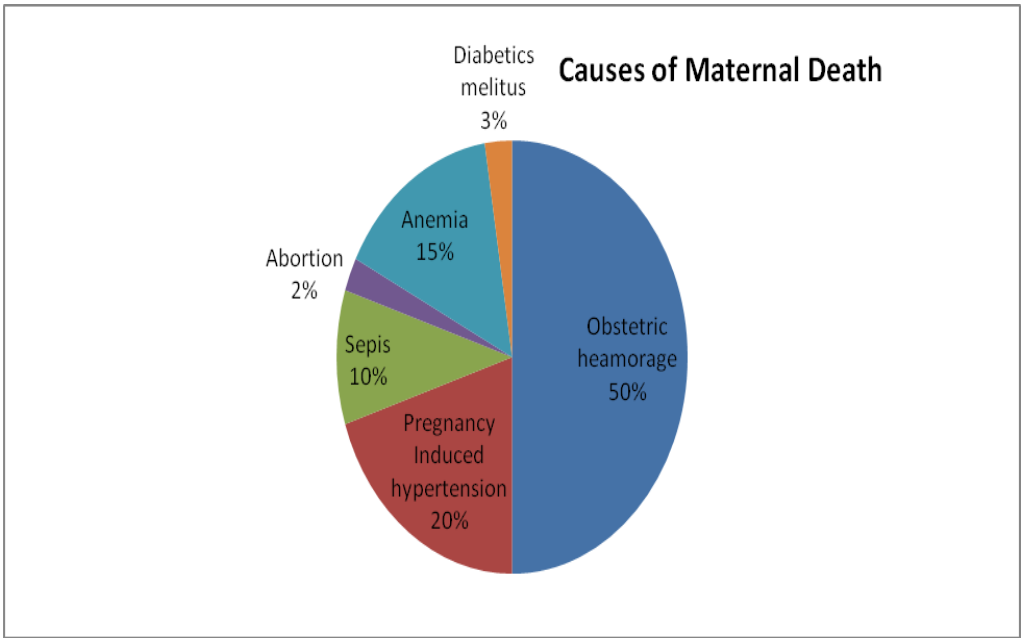

Figure 2: Percentage distribution of obstetric causes of maternal death in Central zone of Tigray.

Results of bivariate and logistic regression analysis on maternal death

The study showed that Level of the woman's education, Place of delivery, ANC visit history, Gestational age, duration of labor or length of labor from admission to delivery, Pregnancy Induced Hypertension, Sepsis and Diabetics mellitus of the respondents were found to be associated with maternal deaths in bivariate analysis. In women's education the risk of maternal death was higher among illiterate women [(AOR=1.5, 95%CI (0.58- 4.03)] than among literate women. After adjusting for possible confounder no significant association was not found between the above variables.

In multivariable analysis only gestational age and Diabetics mellitus have over all significant effect on maternal deaths at 5% level of significant.

Women with diabetics mellitus was 24 times higher risk of maternal death than women's who were not have Diabetics mellitus [AOR=24,95%Cl(5.21-110.91)]. Similarly, Pre tem delivery was 14.4 times higher risk of

maternal death than term deliveries [AOR=14,4%Cl(2.6-79..7)] (**Table4).**

Table 4: **Determinants of maternal death in central zone, Tigray region, Ethiopia (N=200).**

Characteristics	Case	Controls	Total	COR(95%CI)	AOR(95%CI)
Mother's Education					
Illiterate	25(62.5%)	66(41.2%)	91(45.5%)	1	1
Literate	15(37.5%)	94(58.8%)	109(54.5%)	0.66(0.2-2.21)	1.5(0.58-4.03)
Birth Attendant Skilled birth					
Attendant	14(35)	136(85)	150(75)	1	1
Non skilled birth attendant	26(65)	24(15)	50(25)	0.09(0.04-0.21)	0.27(0.03-23.76)
ANC visit					
Yes	37(92.5%)	158(98.8%)	195(97.5%)	1	1
No	3(7.5%)	2(1.2%)	5(2.5%)	0.16(0.02-0.97)	0.73(0.06-9.16)
Gestational age (in weeks)					
Pre term	8(20)	5(3.1)	13(6.5)	1	1
Term	30(75)	153(95.6)	183(791.5)	8.2(2.49-26.66) *****	14.4(2.6-79.7)*
Post term	2(5)	2(1.2)	4(2)	1.6(0.17-15.27)	2.2(0.08-64.19)
Duration of labor					
Less than 12 hrs	28(70)	142(88.8)	170(85)	1	1
Greater than 12 hrs	12(30)	18(11.2)	30(15)	0.29(0.13-0.68)	0.36(0.11-1.20)
Place of delivery					
Health facility	14(35)	136(85)	150(75)	1	1
Home	26(65)	24(15)	50(25)	0.09(0.44-0.71)	0.18(0.01-15.27)
PIH					
Yes	4(10)	3(1.9%)	7(3.5%)	1	1
No	36(90)	157(98.1%)	193(96.5%)	5.8(1.25-27.12)	3.7(0.53-26.7)
Sepsis					
Yes	3(7.5%)	2(1.2%)	5(2.5%)	1	1
No	37(92.5%)	158(98.8%)	195(97.5%)	6.4(1.03-39.7)	11.9(0.9-18.25)
Diabetics Melitus					
Yes	8(20%)	5(3.1%)	13(6.5%)	1	1
No	32(80%)	155(96.9%)	187(93.5%)	7.8(2.38-25.23) *	24(5.21-110.95)*

** Remained statistically significant in both crude and adjusted odds ratio in the above table.*

DISCUSSION

The finding of this study indicated that the mean age of the study subjects were 31.9 years with the SD of ± 6 among the case and 32 years with the SD of ± 6.5 years for controls.

Regarding place of delivery, 14(35%) cases and 136(85%) were delivered at home and 12(30%) of the cases and 18(11.2%) of the controls were extended their duration of labor greater than 12 hrs duration. This finding is comparable with studies conducted in India.[12] and other low and middle income countries.[13]

The main direct and indirect causes of maternal death were post partum hemorrhage (PPH) (50%), Pregnancy-induced hypertension(pre-Eclampsia, Eclampsia)(20%) followed by Anemia (15%). These are all causes which can be reduced by effective emergency antenatal care and skilled care at birth to prevent, detect and manage mild complications and obstetric care. However, our results were consistent with other studies, which is done in Nigeria[17] which reported 48.3% of maternal deaths due to postpartum hemorrhage.

Based on the bivariate analysis maternal level of education is found to be associated with a risk of maternal death, this findings were similar with studies conducted in Pakistan and India.[13,18] The possible reason for this could be illiterate mothers have lack of awareness regarding the seriousness of the maternal health issues, lack of understanding health message and making decision regarding their pregnancy and child birth care.

In Multivariate analysis; women with diabetics mellitus was 24 times higher risk of maternal death than women's who were not have Diabetics mellitus [AOR=24,95%Cl(5.21-110.91)]. This result is in line with a studies conducted in Tanzanya, maternity hospital, 2008.[1,15] This is due to lack of health education on nutrition, personal hygiene, ANC visit needed for Prevention, detection and investigation of anemia and treatment through iron.

Similarly, Pre tem delivery was 14.4 times higher risk of maternal death than term deliveries [AOR=14,4%Cl(2.6-79.7)], the possible reason for this is that the risk of

preterm is higher than the term babies due to having immaturity.

On top of the above regarding the three years pattern of maternal death, there was slightly decreasing of maternal deaths among the communities from from 37.5 to 32.5 in the first and third years of the study respectively. This is in line with study done in India, hospital based study which was decreased in the first and second years of the study respectively.[18] This might be due to having similar sample size of the study subjects.

CONCLUSSION AND RECOMMENDATIONS

The three years pattern of maternal mortality showed decrement from the first year to the second year and slightly increment from second to third year.

Regarding the major causes of maternal deaths Obstetrics hemorrhage after delivery (PPH) and PIH (Pre-Eclampsia, Eclampsia) which accounts 50% and 20% respectively followed by Anemia (15%), In addition to the above, Gestational age and Diabetics mellitus have a significant effect on maternal deaths of central zone of the rural community. Therefore, this highlights the need of community mobilization and inter- sectoral approach to increase the awareness of mothers about the advantages of maternal health service utilization. In addition to reducing delays in accessing care, ways to increase the time between onset of a complication and possible death also need to be explored, especially for a complication such as PPH. Use of intramuscular oxytocics by delivery attendants and peripheral health facilities, as well as upgrading the skills of lower-level health facilities in the effective use of blood substitutes (volume expanders) and in the technique of manual removal of the placenta could increase the time available to transport a woman with hemorrhage to a level of care where blood transfusions are available.

ACKNOWLEDGMENTS

We would like to acknowledge Mekelle University, Ethiopia for granting us the permission to conduct this research.

We are also grateful to all data collectors and study participants for their contribution and support.

Conflict of Interest: The authors declare that they have no competing interests.

REFERENCES

1. Illah E, Assessment of risk factors associated with maternal mortality in rural Tanzania, Johannesburg, south Africa., 2010; 1-18.
2. World Health Organization. 2010. Trends in maternal mortality: 1990 to 2008. Estimates developed by WHO, UNICEF, UNFPA and The World Bank.
3. World Health Organization (2012).Maternal Health. http://www.who.int/topics/maternal_health/en/.
4. United Nations Population Fund. Reducing maternal mortality: The contribution of the right to the highest attainable standard of health.
5. Maternal health epidemiology reproductive health epidemiology series: module 2. Centers for Disease Control and Prevention National C Atlanta, 2003.
6. UNICEF. The state of the world's children 2009. Maternal and Newborn Health. United Nations Children's Fund (UNICEF), 2008.
7. Lawn J. Cousens S and Zupan J. 2005. "Neonatal survival 1: 4 million neonatal deaths: When? Where? Why?", 365(9462): 891–900.
8. United Nations (UN). The Millennium Development Goals Report 2011. New York 2011.
9. Nanda G, Switlick K, Lule E. Accelerating Progress towards Achieving the MDG to Improve Maternal Health: A Collection of Promising Approaches, 2005. Health, Nutrition and Population (HNP) Discussion Paper, The World Bank.
10. Graham W. A new method for linking maternal death with poverty. The familial technique. Lancet, 2004; 363: 23-27.
11. Khan N, Pradhan MR. Identifying factors associated with maternal deaths in Jharkhand, India: a verbal autopsy study. J Health Popul Nutr., 2013; 31: 262-71.
12. Sloan NL, Langer A, Hernandez B, Romero M, Winikoff B. The etiology of maternal mortality in developing countries: what do verbal autopsies tell us? Bull World Health Organ., 2001; 79: 805-10. Medline:11584727.
13. WHO, UNICEF,UNFPA and The world Bank estimations; Trends in maternal mortality:1990 to 2010: 1-70.
14. Gebreamlak G, Alemayehu B, Haftom G; patterns of maternal mortality and associated factors: a case-control study at public hospitals of Tigray region, Ethiopia, 2012; Journal of international pharmaceutical science and research, Aprill 2013; 4(5): 1918-1929.
15. BenoitK, UNFPA country representative: Trends in maternal health in Ethiopia, In-depth analysis of the EDHS2000-2011, December 2012, Adisababa: 1-60.
16. The government of Tigray national regional state, Bureau of health, annual profile, Mekelle, Tigray, Ethiopia, 2004 EFY: XI-XII.
17. Zakariah, A., et al., Reproductive age mortality survey (RAMOS) in Accra, Ghana. Reproductive Health, 2009. 6(1).
18. Campell OMR, Graham. W (2006). Strategies for reducing maternal mortality, Indian, Lancet.
19. BanK, Secretary General of the United Nation; The global campaign for the health millennium development goals, November, 2010; 3-15 www.Norad.No/Globalcampa/Gn.